The performance of robust weighted least squares in the presence of outliers and heteroscedastic errors.

ABSTRACT

The Ordinary Least Squares (OLS) method is the most popular technique in statistics and is often use to estimate the parameters of a model because of tradition and ease of computation. The OLS provides an efficient and unbiased estimates of the parameters when the underlying assumptions, especially the assumption of contant error variances (homoscedasticity), are satisfied. Nonetheless, in real situation it is difficult to retain the error variance homogeneous for many practical reasons and thus there arises the problem of heteroscedasticity. We generally apply the Weighted Least Squares (WLS) procedure to estimate the regression parameters when heteroscedasticity occurs in the data. Nevertheless, there is evidence that the WLS estimators suffer a huge set back in the presence of a few atypical observations that we often call outliers. In this situation the analysis will become more complicated. In this paper we have proposed a robust procedure for the estimation of regression parameters in the situation where heteroscedasticity comes together with the existence of outliers. Here we have employed robust techniques twice, once in estimating the group variances and again in determining weights for the least squares. We call this method Robust Weighted Least Squares (RWLS). The performance of the newly proposed method is investigated extensively by real data sets and Monte Carlo Simulations. The results suggest that the RWLS method offers substantial improvements over the existing methods.

Keyword: Heteroscedasticity; Outliers; Robust estimation; Robust Weighted Least Squares; Monte Carlo Simulation.